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ABSTRACT

This report presents preliminary descriptive data from a national survey of U.S. elementary schools, conducted in 1985, which focused on the schools' instructional uses of computers, including efficiency and cost-effectiveness. Specific topic areas covered include: (1) what hardware is in different types of schools; (2) which teachers use the equipment with their students; (3) allocation of computer time among computer-assisted instruction, programming, discovery-learning, word processing, and other activities; (4) number of students involved in computer use of various types; (5) how much girls, "average" students, and below-grade-level students are using computers in comparison with boys and higher-achieving students; (6) teachers' perceptions of the primary functions of computers and consequences that have emerged from computers' use; (7) changes that have been observed between 1983 and 1985; and (8) the primary problems that teachers see preventing more effective use of computers. Eight graphs illustrate the data presented in this report. Additional detailed analyses of the survey data will be reported in a series of newsletters to be issued on a periodic basis. (DJR)

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The Second National Survey of Instructional Uses of School Computers: A Preliminary Report

Text of an address by

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presented under the title,
"The Second National U.S. School Uses of Microcomputers Survey"
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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

One million computers are now in American elementary and secondary schools. More than fifteen million students used them during the last school year. Five-hundred thousand teachers are using computers -- one-fourth of the nation's school teachers. But important questions remain: How much better off are the schools for their investments? How much more effective have teachers been with their new instructional tools? How significantly has the curriculum changed to become more appropriate to the needs of children? And how much better off are the students for their experiences?

My remarks today reflect my ambivalence: The large part of me that loves computers is overjoyed at the tremendous increase in computer-related activity in U.S. schools in the past two years. But the responsible part of me that is concerned with the efficiency and cost-effectiveness of providing instruction to millions of young people in the establishments we call schools is somewhat skeptical about the meaning and consequences of this activity.

However, I'd like to put the skepticism aside for the time being and talk about what has happened to schools and computers in the past two years. At the 1983 National Educational Computing Conference I reported on my national survey of "school uses of microcomputers." At the time, I reported that although a

majority of U.S. schools had microcomputers, elementary schools with even five computers were rare. Today, I can tell you that a majority of U.S. elementary schools have five or more computers, and there are more than 7500 elementary schools with 15 or more computers. In 1983, most American secondary schools had fewer than a handful of microcomputers; today, half of U.S. secondary schools -- 16,500 secondary schools in all -- have 15 or more computers. Thus, in total, 24,000, or one-quarter of all U.S. schools, have enough computers to at least simultaneously serve between one-half and one full classroom of students at one time.

Serving 15 students in a school that has hundreds or even thousands of students may not sound like much of an accomplishment, but two years ago, countless schools were trying to figure out how to use a single microcomputer with a classroom of students. They could use a single movie projector with a classroom, or a single overhead projector, but a single computer was a different story. Only 6% of today's schools are still in that predicament. A significant plurality have now entered a second phase of their computer history: Now that they have a minimal number of computers, it is time to start to measure how much students are accomplishing.

Along with a quadrupling of the number of computers in schools in the last two years has come a tripling of the number of students using them and a tripling of the number of teachers supervising students in their use. In the typical school this past year, about 150 students used computers during the year. And four to five teachers used computers regularly in their teaching practice.

These statistics are estimates from a new national survey that I have recently completed. Entitled the "Second National Survey of Instructional Uses of School Computers," the survey parallels the one I did two years ago, except that more detailed information was gathered from a larger sample of teachers who were using computers in a broader variety of subjects across the curriculum. The data collection was funded by the National Institute of Education and the National Center for Education Statistics, and was endorsed by eleven major education associations including the National Associations of Elementary and Secondary School Principals, the N.E.A., the A.F.T., the National Council of Teachers of Mathematics, the American Associations of School Librarians and School Administrators, and three computers-in-education groups, I.C.C.E., A.E.D.S., and A.D.C.I.S.

The survey data is based on a probability sample of U.S. public and non-public schools, over 2300 in all. Information about use of computers at these schools was provided by the principal, by the person the principal named as the "Primary Computer-Using Teacher" at their school, by up to four other computer-using teachers, and, in some schools, by one teacher who did not use computers. Between 60 and 70 percent of the persons designated as respondents in each of these categories sent back completed questionnaires -- about 7,000 in all -- and another 1,700 completed 10 to 20-minute telephone interviews. In addition, basic information about the number of computers present and the number of computer-using teachers was obtained, by mail or telephone, for over 95% of the survey sample.

The survey data collection was longer than in the previous survey -- data collection lasted until June. Consequently, we are not as far along in the processing and analysis of the data as we were two years ago. I will be presenting very preliminary results today primarily from the responses of the approximately fifteen hundred "Primary Computer-Using Teachers" who returned their questionnaires by mail -- representing about 70% of the U.S. schools with computers being used by students. These data were just returned from keypunching six days ago, and await further coding of the more complex, open-ended, and hard-to-categorize responses. The data that I will discuss today include the more broad-ranging generalizations about computer-use in the survey respondents' schools. I have not yet begun to do the more detailed analyses comparable to what I did with the 1983 survey data -- for example, in my newsletter series, School Uses of Microcomputers. More importantly, the detailed responses of the computer-using teachers about their own teaching practices have not yet even been keypunched. At the conclusion of my presentation, I will give you a rough outline of the kinds of information and analyses that you can expect to see over the coming year from this study.

I will be presenting preliminary data from the survey on several general topics: What computer hardware is in different types of schools? Which teachers use this equipment with their students? How has computer time been allocated among computer-assisted-instruction, programming, discovery-learning, word-processing, and other activities? How many students are involved in computer use of various types? How much are girls, "average" students, and below-grade-level students using computers in

comparison to boys and higher-achieving students? What do the teachers see as the primary function of computers at their school, and what consequences do they see having emerged from the computers' use? What changes have they observed in the past year or two? And what are the primary problems that teachers see preventing more effective use of computers?

Although I shall present some data on each of these issues, the more interesting analyses with the data involve certain comparisons among the schools that I have not yet had time to make. I shall try to suggest the kinds of questions that additional analysis of the data will help to answer.

The first figure (Figure 1) presents the median number of computers used for instruction at schools of different types. (This includes the few schools that lack computers at all, which is now down to about 7% of secondary schools and 15% of elementary schools.) The median number of computers at large secondary schools -- those with more than one thousand students -- is now 28 computers per school. Ninety-two percent of the high schools with over one thousand students have 15 or more computers. Six percent of all senior highs have 60 or more computers. So there is a substantial fraction of schools -- particularly the large secondary schools -- that are now at least minimally endowed with computer equipment, having enough to provide simultaneous computer-based instruction to one or more classrooms of students.

The median number of computers for senior highs as a whole is 20, and although the smaller secondaries and the junior highs have fewer, all categories of secondary schools still have more computers than the largest elementary schools, which was also the result that I reported in 1983.

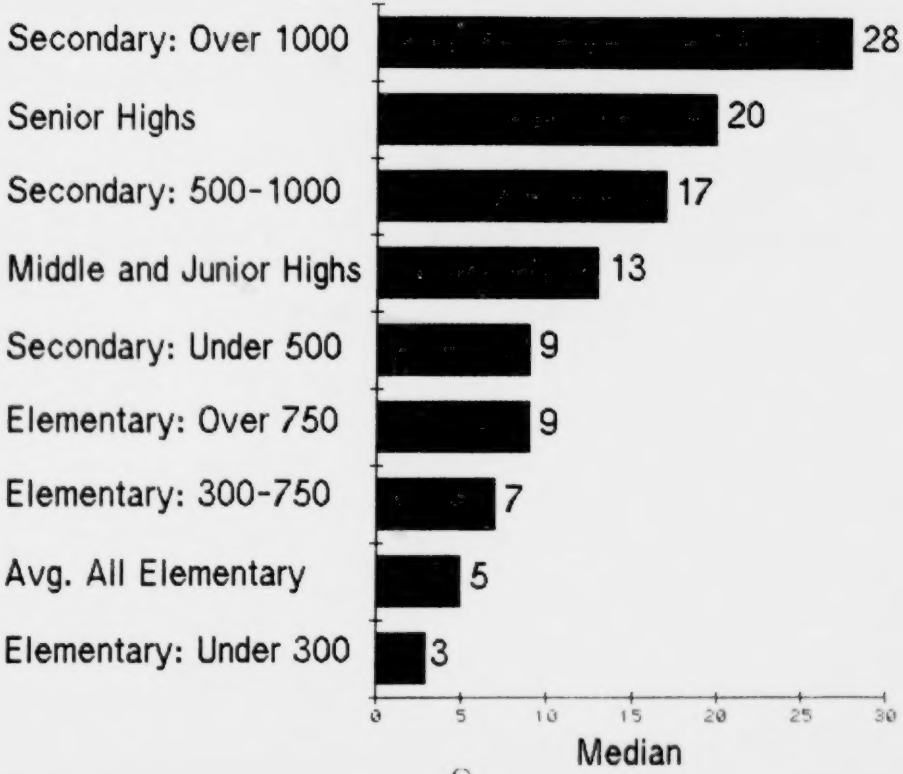
Secondary: Over 1000
28
Senior Highs
20
Secondary: 500-1000
17
Middle and Junior Highs
13
Secondary: Under 500
9
Elementary: Over 750
9
Elementary: 300-750
7
Avg. All Elementary
5
Elementary: Under 300
3
0
5
10
15
20
25
30
Median

FIGURE 1

Interestingly enough, the picture of elementary schools and the number of computers they have in 1985 parallels substantially the portrait I gave for secondary schools in 1983. And, in 1983, elementary schools looked pretty much like secondary schools in 1981. So elementary schools seem to be following the acquisition patterns of secondary schools by about two years.

In addition to computers, schools have a variety of computer-related equipment. Over three-quarters of the elementary schools that have a computer also have a printer, although most have only one. Nearly all of the secondary schools with computers have a printer and the majority of these schools have three or more printers. There are two other areas besides multiple printers that elementary schools are substantially behind secondary schools. One is in modems. About one-quarter of computer-using secondary schools have modems, but only about 7% of elementary schools reported having a modem. The other area is plotters -- only 1% of elementary schools reported plotters, but 10% of secondary schools reported having plotters.

I should point out that most of the data I am presenting here comes from the 70% of the sample of primary computer-using teachers who responded by mail. In taking a first quick look at how my 70% sample differs from the 30% who we talked to by telephone or who didn't respond, it appears that the more active schools responded by mail. Therefore, it would be best, for now, to think of these as high estimates. Among elementary schools, for instance, the schools responding had about double the average number of computers as the ones that didn't respond. Consequently, the overall picture on other items, for example, modems

or printers, is somewhat lower than the figures shown here will suggest. For secondary schools, the differential between the mailed-in responses and the other schools wasn't as great.

Who's using these computers and how has it changed? Figure 2 reports data on the number of teachers who regularly use computers with students in secondary schools. The data includes only those schools that had computers in 1983. The figure depicts the increase during the past two years in the number of teachers at a computer-owning school who do use computers. There's obviously been a substantial increase. Whereas in 1983 typically only one or two teachers used computers, now it is many more. Two-thirds of the computer-using secondary schools have at least three teachers regularly using computers in their school, and one-third have at least six. For elementary schools, it's about the same.

Who is the Primary Computer-Using Teacher -- the person who answered these questions? Is there a new role developing, that of a computer coordinator who is only secondarily a teacher? The answer is -- slowly. In over 50% of the cases, both elementary and secondary, the Primary Computer-Using Teacher was a classroom teacher. In secondary schools, another 20% was a department chairman. In elementary schools, 20% were librarians or schools administrators. Only 7% of elementary and 4% of secondary school Primary Computer-Using Teachers designated themselves as Computer Coordinators -- someone whose primary responsibility was coordinating computer use for one school or for many schools. So for the most part, we still have the situation of classroom teachers -- both generalists and subject-matter specialists -- who are the persons most knowledgeable and most active in the use of computers in schools.

Some of the data that I'm going to report -- and that includes this next chart -- comes from data supplied by the principal about all computer-using teachers at the school. This was a quick and dirty estimate as to how many they were and what subjects they taught. Figure 3 suggests that a minority of the computer-using teachers in secondary schools are math teachers or computer specialists. I would say that in 1983 if I had been able to make this chart, math and computer specialists would have constituted a much larger proportion of the total. But as you can see, the math and computer area constitutes maybe 40% of all secondary school comptuer-using teachers.

Now this doesn't mean that if you count minutes of time the computers are used you would find that 40% of all the time is spent in math class work or computer class work. That again waits for further analysis. I suspect it's the case that it will be a larger proportion. But the principals did report that computer-using teachers of most subjects -- not just the math and programming teachers -- typically used computers, not just one or two weeks a year, but for several weeks, more than 5, 6 to 10, sometimes 11 or more weeks during the year.

I still suspect that the math and computer teacher has more computers at his disposal than does the social studies teacher or the special education teacher, and so again if we count time, we will count more math and computer activity, but, it won't be as dramatic as it was two years ago.

At the elementary level, about 2/3 of the pie-chart would be filled with general classroom teachers, 10% special education, and then smaller proportions of math specialists, reading specialists, and computer specialists.

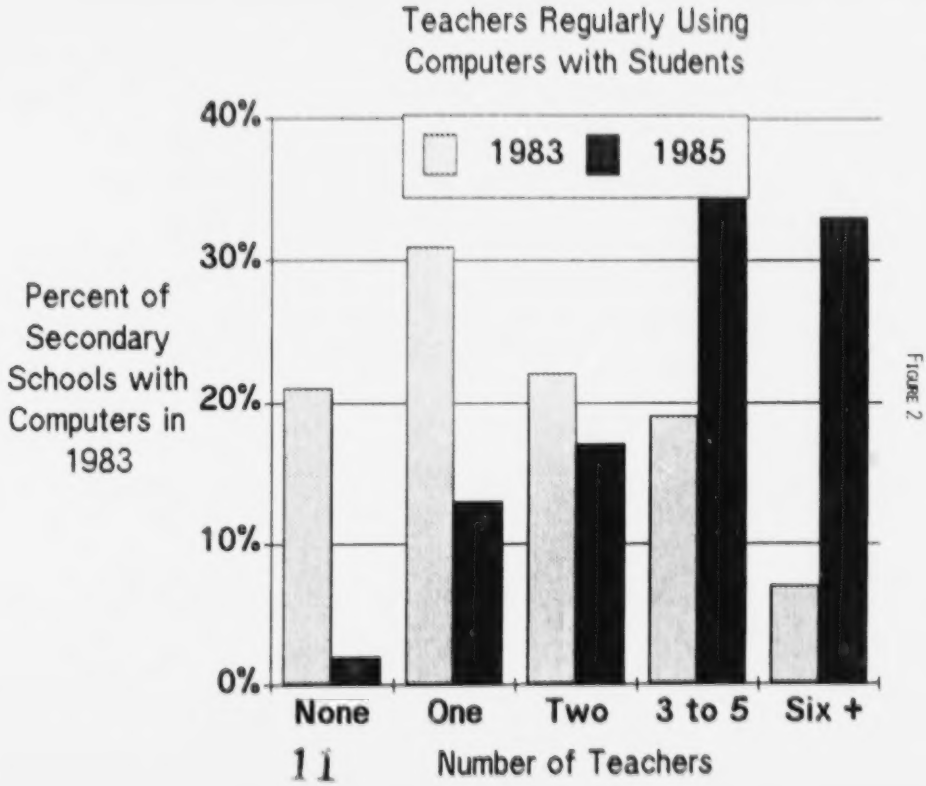
Teachers Regularly Using
Computers with Students
1983
1985
40%
30%
20%
10%
0%
Percent of
Secondary
Schools with
Computers in
1983
None
One
Two
3 to 5
Six +
Number of Teachers

FIGURE 2

Secondary School Computer-
Using Teachers

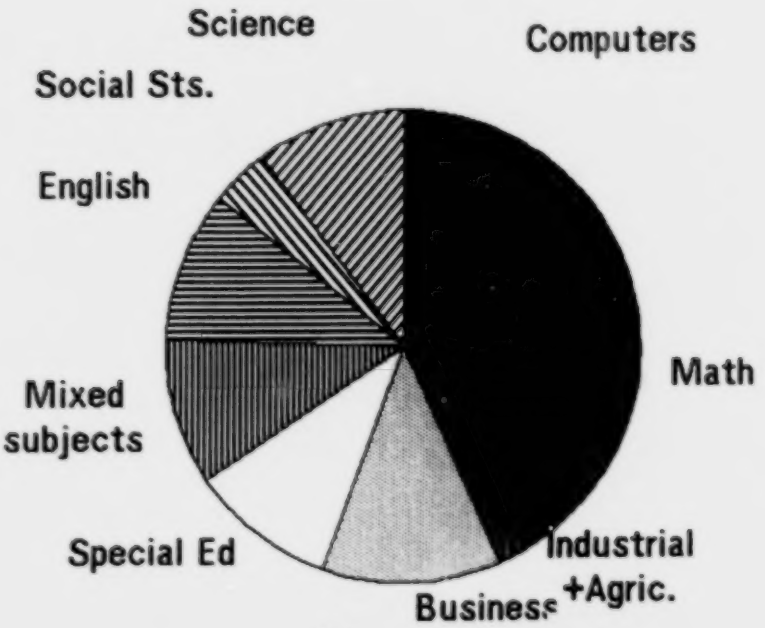

FIGURE 3

Figure 3, which we have been looking at, says "taking all of the computer-using teachers, what do they teach?" The next chart (Figure 4) takes all of the teachers by subject, and asks "what proportion of those teachers use computers?" That is, what proportion of computer teachers use computers, what proportion of math teachers use computers, what proportion of industrial arts use computers and so forth? Secondary schools again.

These estimates are even "iffier" than the others. The denominator for these comes from a different source -- a 1979 National Center for Education Statistics table on the total number of teachers by subject in the U.S. I will be able to do a better job when I can get to that portion of my data that will provide a better denominator than I've got here, but this is the best we can do for now. The NCES table didn't list "computer teachers," but I assume that 100% of the computer teachers use computers in their teaching. Notice, though, that the proportion of business education teachers who use computers (as reported by the principal) was substantially higher than the proportion of mathematics teachers who used computers.

This is a little tricky in that teachers who are computer teachers used to be math teachers for the most part, so the numerator of math teachers has shrunk a little bit, because a lot of them are called computer teachers now. But it is still the case that among those teachers that the principal designated as math teachers, a smaller proportion of them are using computers than are business education teachers. After math, business and computers comes two other subjects, science and industrial arts/agriculture. About one-eighth or one-tenth of the teachers

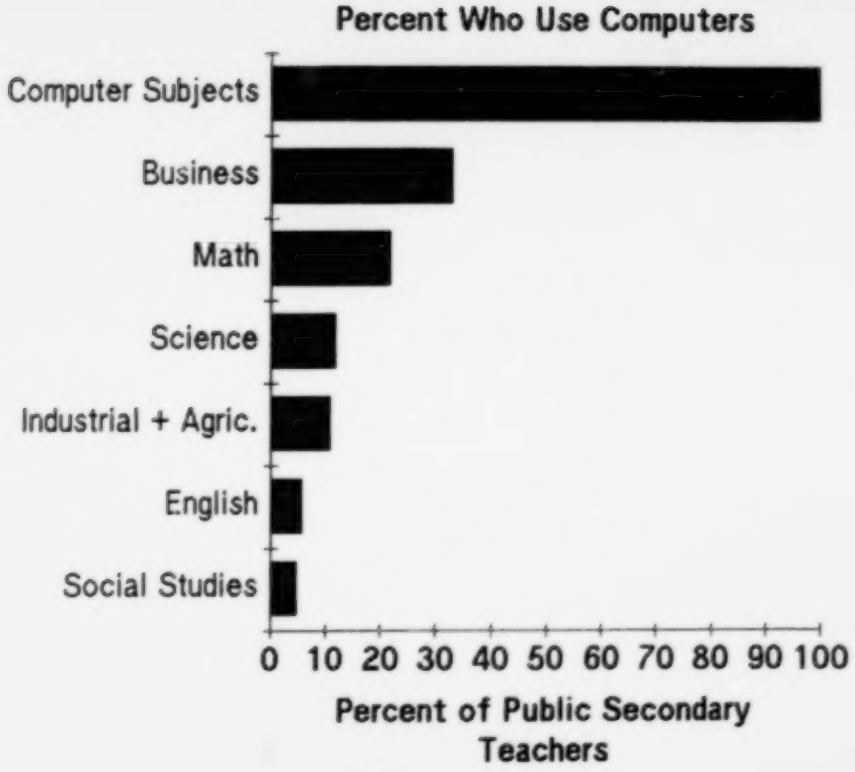
Percent Who Use Computers
Computer Subjects
Business
Math
Science
Industrial + Agric.
English
Social Studies
0 10 20 30 40 50 60 70 80 90 100
Percent of Public Secondary Teachers

Figure 4

in those fields are using computers in their classrooms as reported by the principal. It is interesting that the vocational areas -- business, industrial arts, agriculture -- are substantially higher than many of the academic areas -- English and social studies in particular.

One thing that I was a little surprised about is that it is not that the entire math department uses computers, or the entire English department for that matter. More commonly, one or at most, two, teachers of a given subject in a school are computer-using teachers for that subject. So there's a spread across subject matters, but there tends to be a computer specialist for that subject matter for that department. It was even the case in mathematics.

We're all interested in knowing what the kids are doing with the computers, and at this point my data is fairly fragmentary. However, I did ask the Primary Computer-Using Teacher to divide 100% of the students' computer use among 5 basic activities -- word processing, computer assisted instruction, discovery learning and problem solving, programming, and "other." This next pie-chart (Figure 5) combines elementary and secondary school responses together.

But more importantly, each school counts the same, whether it's an elementary school that has one computer in use for 5 hours a week or a high school with 60 computers going all day long. When we count every school the same like that, we get CAI constituting half of the activity -- half of the computer related activity -- and programming substantially less; discovery learning next; and word processing next. But I don't think that

Major Categories of Student Computer Use

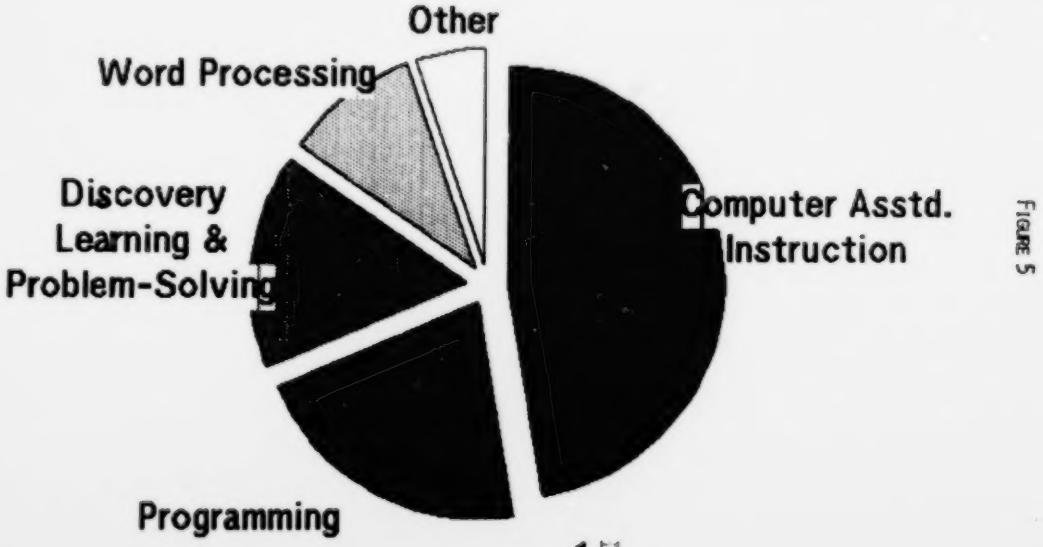

FIGURE 5

is as useful as the analysis that I'll get to soon, in which we count activity according to the amount of time or the number of students who engage in an activity for a substantial amount of time.

Figure 5 is actually a dangerous table. Be careful of tables like this that count each school the same -- where an elementary school with one computer counts the same as a secondary school with sixty. So, being very explicit about what the numbers in the pie-chart represent, they are accurate proportions, but I don't put too much stock in their importance -- that's why I left the actual percentages off the figure.

"When your school got its first computer, which of these was seen as the computer's most useful application: as a method of improving students' basic skills in mathematics and language, as a resource for students to learn more about computers, or as a tool for students to accomplish an academic task as in writing, analyzing data, or solving problems?" "And today, the school's computers are best seen..." (same choices). Figure 6 presents the answers to these two items by Primary Computer-Using Teachers in schools that have had computers for at least two years. The first column is their response of how they saw the computer when they first got it; and the second column is how they see their computer now. The first two columns are for elementary schools and the second two are for secondary.

There is a strong increase in the proportion of respondents who see their computer as a tool for applications -- for writing, problem solving, or analyzing data. There's a decrease in responses for each of the other two categories -- learning about

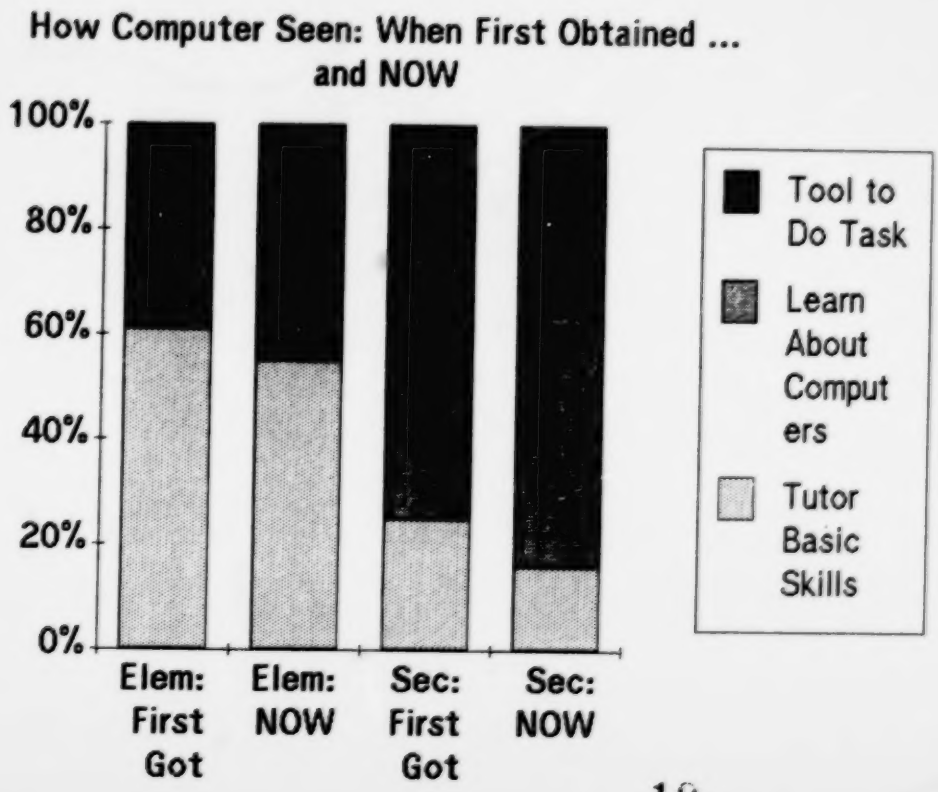
How Computer Seen: When First Obtained ... and NOW
100%
80%
60%
40%
20%
0%
Elem: First Got
Elem: NOW
Sec: First Got
Sec: NOW
Tool to Do Task
Learn About Computers
Tutor Basic Skills

FIGURE 6

computers and instruction in basic skills. At the secondary level, the proportion giving the "tool" or "applications" response increased from about 10% to about 30%. Nevertheless, the figure shows that in the secondary school, a majority still feel that learning about computers -- programming and computer literacy -- is the primary useful function of computers, and a majority in elementary schools feels that CAI is the primary utility. But the over-time trend, although small, is in the direction of applications.

How many kids are getting to use their school's computers? In 1983, I reported that about 70 to 80 kids per school used computers in some way. This time I said 150 per school. Now what I'm going to do is to look at only larger schools. If we look only at schools with 500 or more kids and examine how many kids used computers between September, 1984 and January, 1985, we get a mean response of 280 in the elementary school and 300 in the secondary school. Note the secondary schools are substantially larger than the elementary schools, even when we limit ourselves to elementary schools over 500 kids. But the number of kids per school using computers at each level was still the same. This is similiar to the kind of results I got in '83 where the secondary schools used computers with proportionally fewer kids but gave each student a longer turn.

In this survey, we asked respondents to make estimates about the number of students who used the computers "every day for several months." The mean number at the elementary level (schools over 500 students) was 35; the mean number at the secondary level was 107. Again, it seems to be the case that

elementary schools are enabling more students to use computers a little bit, but that secondary schools are giving substantial chunks of consecutive daily use to many more students. This is my first look at the issue of time and intensity of use. I'll be able to do much better when I get to the rest of the data.

Now, the question of differential use by girls and boys, and by higher- and lower-ability students. I didn't avoid the issue of sex differentiation last time, I just didn't think of it, I'm sorry to say. This time I asked about it in a number of different ways, including asking each teacher to name the three kids who seemed to be the most affected in some way by using computers. I asked them to list their sex, their ability level, and how they were affected. I don't have that data for you today, but I do have some data from the Primary Computer-Using Teacher. "For each of the following aspects of computer use, about what percent of the use in your school is by girls?" "Among all student users, among students who use the computer before or after school, among students who do word processing, among students in elective computer programming classes, and among students who play computer games."

Before- and after-school use seems to be the most male-dominated of the activities. Figure 7 shows the median percent of users who are girls. The lighter line is elementary, the darker line is secondary. Actually, the most male-dominated activity at the secondary level is "games" and at the elementary level it is "programming." But overall, before- and after-school use is the most heavily male area of computer use in school.

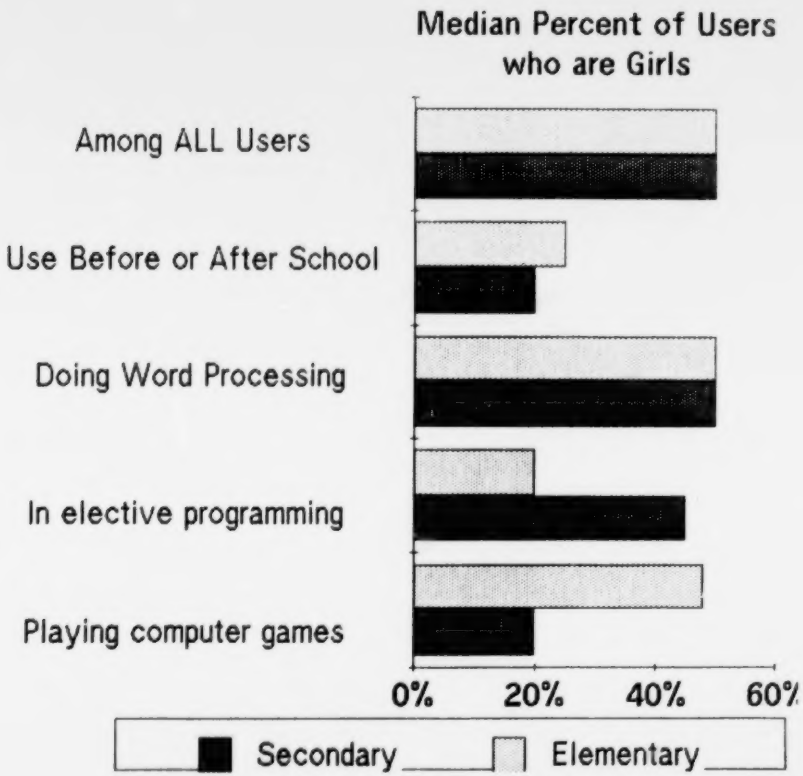
Median Percent of Users who are Girls
Among ALL Users
Use Before or After School
Doing Word Processing
In elective programming
Playing computer games
0%
20%
40%
60%
Secondary
Elementary

FIGURE 7

The "elective programming" result was a little surprising to me. Many of the elementary school teachers reported that there were no girls doing elective programming activities. Of course, there were probably not too many boys either. (My impression of how much programming is going on at the elementary level is that there is very little.) So the fact that there is a smaller proportion female among students in elective programming activities at the elementary than at the secondary level probably means that there are 2 or 3 boys and no girls doing programming apart from required classwork. At the secondary level, it's nearly half females in elective programming classes.

I looked at the sex distribution one other way. Dominance by males, let's say, is indicated by less than 40% female. That is, there's a range of 40 to 60 that is basically the same. So the question is, what proportion of the schools report male dominance -- that is, girls constituting less than 40% of the users?

Among all users, a third of the secondary schools report male dominance. Only 15% of the elementary schools report male dominance, defined in that way. For before- or after-school use, 60 to 70% of the schools that have any before- or after-school use report male dominance. For word processing, a substantial proportion of schools report male dominance -- one quarter of the secondary schools whose students do any word processing and 2/5 of the elementary. About half of the schools with elective programming classes report male dominance in this activity, and in game playing males dominate in about three-fourths of secondary schools and half of elementary schools where games are played.

There are a couple ways of looking at the previous tables. One is that a lot of the medians were 40 to 50 percent female, which says that there is a fair amount of equality in much of the use. But from another perspective, there are a substantial proportion of schools for which male dominance is a descriptive fact in terms of computer use. The more independent and teacher-free the activity, the more the male dominance. The more the teachers control the activity, the less the male dominance.

What about the dominance of higher achieving students compared to average and below-average students? In 1983, the higher-achieving students were clearly dominating their schools' use of computers. This time I would say that that dominance is still present, but in only about half of the schools, and probably not as severely as it used to be. After all, it was the higher-achieving students who brought the computers into the schools in the first place, along with the faculty who paid attention to their special needs and interests.

Looking at the data in Figure 8 -- the darkest lines are the proportion of schools reporting that the higher-achieving students are using the computer <u>much more</u> than the average students. "Higher-achieving" was defined for the respondents as the top third of each year's class, and "average" as the middle third.

Particularly in elective programming activities, but also for before- and after-school time, word processing, and overall use, the higher achieving students in about half of the schools were reported to be using the computer more or much more than average students. This is elementary and secondary combined, since the

Higher-Achieving Students' Use Compared to Average Students

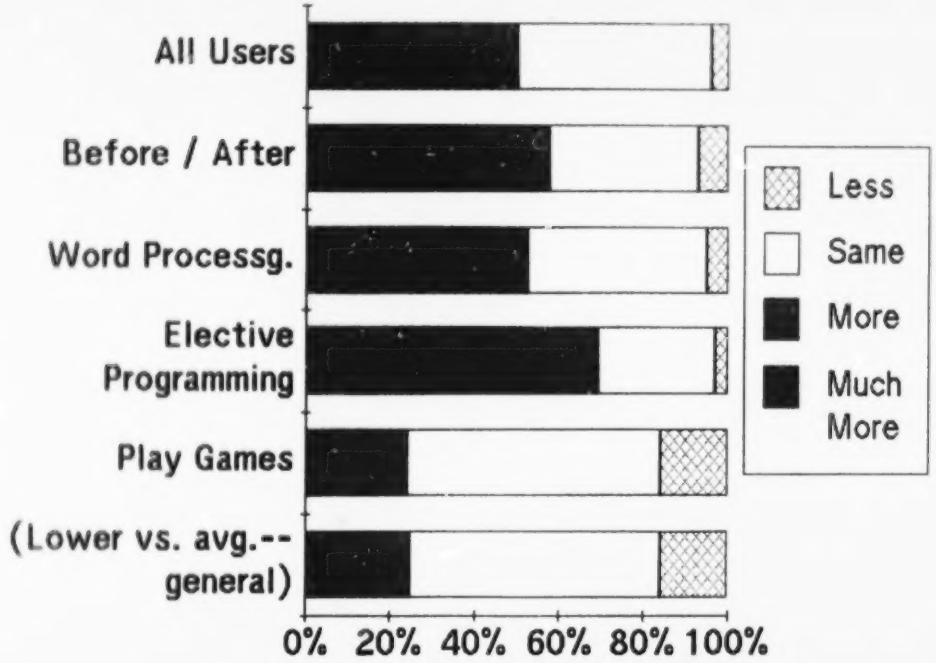

FIGURE 8

results were almost the same at both levels. Even though the mix of activities is different at the two levels, the picture is the same. Only in game-playing did use by average students approximate that by the higher-achieving students.

The bottom row of Figure 8 looks at the lower-achieving students versus the average. Overall, most schools report no more and no less use by lower-achieving students than by average-achieving students. However, in a small minority of schools, perhaps 15%, computer use is intentionally and disproportionately allocated to lower achieving students.

What are the outcomes for students of all of this computer activity? Unfortunately outcomes are only weakly measured by a survey. To measure outcomes properly, formal experiments are required along with detailed observations and random assignments of students to experimental and control groups. In the absence of more appropriate data, we asked the teachers what they perceived the outcomes of computer use to have been.

In 1983, I found that the teachers observed <u>social</u> changes occurring more frequently than <u>learning</u> outcomes and that whatever improvements in learning that were perceived were restricted to the higher-ability students. This time, my preliminary examination of the same survey questions reveals somewhat similar results, but there are indications that perceived academic improvements are broadening out.

Improved student enthusiasm still appears to be the primary benefit that the teachers see in using computers. The second-most often perceived benefit is that opportunities for gifted

students have improved because of having computers. And teachers still see that computers have brought increased mutual assistance among students and given students opportunities to work independently of adults. But besides these results -- which were similar to ones found two years ago -- there has been an increase in the proportion of teachers who reported that computers have assisted the learning of below-average students. Also, we now find that about three-fourths as many teachers see computers having given significant opportunities to learning-disabled students as the number who reported similar opportunities for gifted students.

The outcomes least often mentioned as having been improved by computers are individualization of learning tasks, diagnoses of student learning problems, and help for average students.

Schools have different purposes for using computers. For some, the purpose is to give gifted students opportunities to expand their minds. For such schools improving diagnoses of learning difficulties is not an important goal. For other schools for whom the purpose of the computer is to improve the basic skills of students, improving learning diagnoses is very important. In future analysis of this data, I will examine teachers' perception of the impact of computers in the areas they feel computers are important. The summary I've just presented is just a first look.

The survey has also revealed some other changes in computer use, and I'll mention some of these. Schools are reporting fewer days in which their computers are not in use. Schools are reporting an increase in students waiting in line or signing up

in advance to use computers. More teachers are borrowing school computers to use them at home (done in about two-thirds of the schools now). Arcade game use is down more places than it's up, and about half of the elementary schools and three-fourths of the secondary schools allow arcade games to be played at various times.

Computer crime is a big topic in the press. I asked the Primary Computer-Using Teachers to answer this question: "As far as you know, have any of the following problems arisen regarding your school's computers -- theft or vandalism of computer equipment, theft or intentional destruction of software, large-scale copying of copyrighted programs, or unauthorized access to computer data? And, if so, how often -- often, several times, two or three times, once, or never?"

Computer crime seems to be a problem only in a small minority of schools. The following are the proportions of teachers who reported more than one occurrence: 3% reported unauthorized access more than once, 17% reported large scale copying more than once, 11% reported theft or intentional destruction of software more than once, and 5% reported theft or vandalism of hardware more than once. On the other hand, 95% said <u>never</u> any unauthorized access, 80% said <u>never</u> any large scale copying, 80% said <u>never</u> any theft of software, 80% said <u>never</u> any theft or vandalism of hardware.

Of these four problems, only one seems substantial -- the copying of commercial programs, where about 8% -- or one school in twelve -- reported that large-scale copying occurred "several times" or "often." Obviously, there may be bias in these

reported occurrences. However, I don't believe the teachers felt like they were in a position of having to lie. Some may be deceiving themselves, but I don't think they were being purposefully untruthful in the questionnaire.

There are a lot of problems with using computers that are more significant than copying software. I thought it would be instructive to see which ones the teachers felt were the most important problems in effectively using their schools' computers. I gave them a list of eight problems and an "other" choice, and they were asked to choose three.

Not surprisingly, the main problem for these Primary Computer-Using Teachers was not having enough resources. Three of the five most frequent choices were "not enough computers"; "software too costly in the quantity needed"; and "not enough money for teacher training."

Next to not having enough computers, the other problem teachers perceived most often was "not having time to develop computer-based activities." The survey asked about teachers being given release time to do curriculum development but I haven't analyzed that data yet. I suspect that very few reported receiving any compensation for computer-related curriculum development.

"Teachers lacking interest in learning about computers" was the third most frequently named problem. Apparently these Primary Computer-Using Teachers are having difficulty in promoting computer-use among teachers not already drawn to the computer on their own.

If these were the problems most often checked, which ones were least checked? Software problems were at the bottom of the list. "Poor quality of software" and "software not yet written for topics for which it's needed" -- these were the problems least likely to be named by the respondents.

Should schools put computers in a laboratory where everyone can get at them, but where they're not in classrooms, or should they give computers to the teachers to put in their own classrooms? I did some analysis using the 1983 data to find out whether the location of the school's computers was related to perceiving more learning being accomplished, more student enthusiasm, and so on. I concluded that, on balance, labs were a better placement.

This time I asked the teachers for their opinion. I asked (approximately) "If you had a school with 15 computers, where should they go?" It was a fixed-choice question, but I think the choices were fair: (a) one laboratory; (b) one lab with 7 computers and 8 more in different classrooms; (c) divide all 15 into as many classrooms as possible; and (d) rotate them together from room to room. A plurality of both elementary and secondary school respondents said "put them in one laboratory." Nearly half of the secondary school respondents said this; more than one-third of the elementary. (However, remember that the respondents here are the Primary Computer-Using Teachers -- the remaining computer-using teachers were not included.) The next most common response was to put half in a lab and the others in classrooms. "Only in classrooms" was in third place, but in the elementary schools, about one-fourth wanted them only in class-

rooms. Hardly anyone wanted them to rotate from room to room as a group.

Finally, I asked the teachers about their opinion on appropriate prices for multiple copies of the same software. I asked the following question: "Software companies usually charge schools the same amount for each copy of a program they buy. Sometimes companies offer discounts for multiple purchases. In your opinion, what would be a fair price to charge a school for ten copies of a program that costs $50 for a single copy?" The modal, or most common, response was $100. The median response was $200, and the mean was about $220.

The survey results I've reported today are some descriptive data based on the 70% of the Primary Computer-Using Teachers who responded by mail. Additional analysis over the coming year will extend the detail on each of the topics presented today, and will discuss other topics including the following: the type of computer-based instruction provided to students with learning disabilities and handicaps; attitudes and practices of teachers regarding children's use of typewriters and word-processing programs; the use of computers in teaching mathematical concepts; the use of computers in vocational education programs; teachers' perceptions of the functions and consequences of teaching students to program in the Logo language; problems of software acquisition and evaluation; the impact of formal in-service teacher training on teacher computer skills; what students are taught in computer-literacy units; and teachers' use of computers as tools of their profession.

As the data analysis progresses, other topics may be added to this list or supercede some of the topics initially chosen, based on feedback from my audience and on current trends in public discussion of the use of computers in schools.

After the 1983 survey, I sent out a series of newsletters on a periodic basis to report on my analyses. I will do the same with the 1985 survey data. I hope to stick to an every-other-month schedule beginning in November. I'll be sending the first issue to everyone who has previously requsted information about either of my surveys. After that it will depend on our funding situation. We're currently applying to continue as a National Institute of Education Research and Development Center. If we succeed, we'll be able to send the remaining newsletters for a nominal charge. Otherwise, we'll have to charge somewhat more, and the series may come to a quicker end. Full subscription information will accompany the first newsletter in November. Thanks very much for your attention.

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